bring out the full power of the engine; the effect produced being simply that of increasing the speed of the wheel, and not that of the vessel. 7thly. An increase of speed will be obtained by reducing the diameter of the wheel; at least within such limits as allow of the floats remaining sufficiently immersed in the water; and provided the velocity of the engine does not exceed that at which it can perform its work properly. 8thly. An advantage would be gained by giving to the wheel a larger diameter, as far as the immersion of the paddles produced by loading the vessel would not so sensibly affect the angle of inclination of the paddle; but this advantage cannot be obtained with an engine of the same length of stroke, because in order to allow the engine to make its full number of strokes, it will then be necessary to diminish the size of the paddles, which is a much greater evil than having a wheel of smaller diameter with larger paddles.

The reading of a paper was then commenced, entitled, "On the Equilibrium of a Mass of Homogeneous Fluid at liberty." By James Ivory, Esq., K.H., M.A., F.R.S.

June 5, 1834.

FRANCIS BAILY, Esq., Vice-President, in the Chair.

John Marquess of Breadalbane; Charles John Lord Teignmouth; the Hon. George Elliot, R.N.; the Rev. Frederick William Hope, M.A.; Joseph Jekyll, jun., Esq., M.A.; the Rev. Robert Murphy, M.A.; the Hon. Sir George Rose; Richard Twining, Esq.; William Robert Whatton, Esq.; and George Witt, M.D., were elected Fellows of the Society.

Mr. Ivory's paper, entitled, "On the Equilibrium of a Mass of Homogeneous Fluid at liberty," was resumed and concluded.

The author shows that Clairaut's theory of the equilibrium of fluids, however seductive by its conciseness and neatness, and by the skill displayed in its analytical construction, is yet insufficient to solve the problem in all its generality. The equations of the upper surface of the fluid, and of all the level surfaces underneath it, are derived, in that theory, from the single expression of the hydrostatic pressure, and are entirely dependent on the differential equation of the surface. They require, therefore, that this latter equation be determinate and explicitly given; and accordingly they are sufficient to solve the problem when the forces are known algebraical expressions of the co-ordinates of the point of action; but they are not sufficient when the forces are not explicitly given, but depend, as they do in the case of a homogeneous planet, on the assumed figure of the fluid. In this latter case, the solution of the problem requires, farther, that the equations be brought to a determinate form by eliminating all that varies with the unknown figure of the fluid; and the means of doing

this are not provided for in the theory of Clairaut, which tacitly assumes that the forces urging the interior particles are derived from the forces at the upper surface, merely by changing the co-ordinates at the point of action. In the case of a homogeneous planet, the forces acting on the interior particles are not deducible, in the manner supposed, from the forces at the surface.

After showing that the equilibrium of a fluid, entirely at liberty, will not be disturbed by a pressure of the same intensity applied to all the parts of the exterior surface, the author considers the action of the forces upon the particles in the interior parts of the body of the fluid; and shows that although the forces at the surface are universally deducible from the general expressions of the forces of the interior parts, yet the converse of this proposition is not universally true, the former not being always deducible from the latter; a distinction which is not attended to in Clairaut's theory. He then investigates the manner in which these two classes of forces are connected together; establishes a general theorem on the subject; and proceeds to its application to some of the principal problems, relating to the equilibrium of a homogeneous fluid at liberty, and of which the particles attract one another with forces, first in the inverse duplicate ratio, and secondly in the direct ratio of the distance, at the same time that they are urged by a centrifugal force arising from their revolution round an axis. The author concludes with some remarks on Maclaurin's demonstration of the equilibrium of the oblate elliptical spheroid; and on the method of investigation followed in the paper published in the Philosophical Transactions for 1824. In an Appendix the author subjoins some remarks on the manner in which this subject has been treated by M. Poisson.

The reading of a paper was then commenced, entitled, "Experimental Researches in Electricity;" Eighth Series." By Michael Faraday, Esq., D.C.L., F.R.S.

June 12, 1834.

BENJAMIN COLLINS BRODIE, Esq., Vice-President, in the Chair.

A paper was read, entitled, "On the Arcs of certain Parabolic Curves." By Henry Fox Talbot, Esq., M.P., F.R.S.

The general equation to parabolic curves, (namely, $nu = v^n$; where u is the abscissa and v the ordinate,) gives for the arc of the curve an expression which, excepting in a very few instances, is transcendental. But although the length of an arc, considered by itself, cannot be assigned algebraically, yet it frequently happens that the sum of two or more arcs is capable of being so assigned, and sometimes in a very simple manner. The author has found this reduction to take place in so many instances, as to incline him to believe that it may be universally possible, provided the exponent (n) of the ordinate in the equation to the curve is a rational quantity of these reductions: he